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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/668,975

09/23/2003

John C. Kralik

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EXAMINER

BOUTSIKARIS, LEONIDAS

ART UNIT

PAPER NUMBER

2872

DATE MAILED: 03/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/668,975

Applicant(s)

KRALIK ET AL. 

Examiner

Leo Boutsikaris

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 April 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 1-7 and 17-23 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 8-10, 13-16, 24 and 25 is/are rejected.
- 7) ☒ Claim(s) 11, 12 and 26-30 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>9/23/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of Species V in the reply filed on 4/25/2005 is acknowledged. Claims 1-7, 17-23 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Species, there being no allowable generic or linking claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 8-10, 13, 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Birdwell (US 5,877,876).

Regarding claim 8, Birdwell discloses an optical switching/routing system comprising (Figs. 17A, 17B);

a polarization separating sub-system (232A, 234A, 236A) capable of separating an input optical beam 244 into a first optical beam of a first polarization and a second optical beam of a second polarization distinct from the first polarization, and emitting a first emitted optical beam of a third polarization (at the output of the top half of the beamsplitter 232A) and a second

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emitted optical beam of the same third polarization (at the output of the reflecting prism 236A, and after passing through half-wave plate 234A), said emitted first and emitted second optical beams constituting an input channel of said third polarization;

a polarization recombining sub-system (232B, 234B, 236B); and

a grating based selectable switching/routing sub-system (230A, 246, 230B) including at least one pixilated switchable component, said sub-system interposed optically between said polarization separating sub-system (232A, 234A, 236A) and said polarization recombining sub-system (232B, 234B, 236B); and

said selectable switching/routing sub-system capable of switching/routing said input channel to an output channel of a fourth polarization, said output channel constituting a pair of output beams of said fourth polarization (said two beams being one at the input of reflecting prism 242B, and the second one being at the input of beamsplitter 232B);

said polarization recombining sub-system capable of recombining said pair of output beams of said fourth polarization into a final output beam of combined polarization entering output fiber 240B (line 39, col. 18 to line 18, col. 19, lines 7-26, col. 20). It is noted that "234B" in Fig. 17b should be "230B", based on the above discussion.

Regarding claim 9, the polarization separating sub-system comprises a polarization splitter 232A and a patterned polarization converter 234A.

Regarding claim 10, the polarization recombining sub-system comprises a patterned polarization converter 234B and a polarization combiner 232B.

Regarding claim 13, the third polarization is the same as the first polarization.

Regarding claim 15, the fourth, third and first polarizations are all the same.

Claims 24-25 are rejected under 35 U.S.C. 102(b) as being anticipated by Dickson (US 5,272,550).

Regarding claim 24 Dickson discloses a polarization separating/combining system comprising a pair of polarization sensitive gratings 18 and 30; wherein the first grating 18 receives an input beam of electromagnetic radiation and separates said input beam into a first separated beam 20 of a first polarization, e.g., S polarization, and a second separated beam 22 of a second polarization, e.g., P polarization (Fig. 1, line 54, col. 2 to line 12, col. 3, line 57, col. 4 to line 3, col. 5, lines 21-24, col. 5, lines 35-44, col. 5); a second grating 30 aligned with the first grating 18 such that it receives first separated beam 20 of first polarization and second separated beam 22 of second polarization, and capable of providing a first output beam 20 of the first polarization (no diffraction occurring at 30), and a second output beam 22 of the second polarization (depending on the thickness of hologram 30). Regarding the function of the grating pair as a polarization combining system, due to the reciprocity principle in optics, beams 20 and 22 incident on hologram 30 produce an output at the other end of the device which represents an output beam of combined polarization.

Regarding claim 25, output diffracted beams 20 and 22 represent adjacent diffracted orders and they are substantially parallel.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are

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such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 14, 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Birdwell (US 5,877,876) in view of Wu (US 5,946,116).

Regarding claim 14, Birdwell discloses all the limitations of said claim except for teaching the specific combination of a polarization splitter in the form of a birefringent element followed by a patterned polarization converter (instead of the combination of a polarization beamsplitter followed by a polarization converter after one of the output faces of the beamsplitter cube disclosed by Birdwell). Wu discloses an optical switching/routing system (Fig. 5a), wherein at the input end, a birefringent element 30 splitting an input beam into two beams of different polarization is followed by a patterned polarization converter 100, whose one region receives one of the outputs of the birefringent element and outputs a beam with different polarization and another region receives the other one of the outputs of the birefringent element and outputs a beam without changing the polarization (lines 5-10, col. 7). It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the combination disclosed by Birdwell with the combination taught by Wu, for producing a pair of separated optical beams with the same polarization, since the pair of beams at the output of the polarization splitter taught by Wu are closer in space compared with the polarization splitter taught by Birdwell because of the geometry of the utilized optical elements, thus resulting in a more compact optical system.

It is noted that the optical switching/routing system depicted in Fig. 5a of Wu is the same as the claimed system, except that the selectable switching/routing subsystem is not based on diffractive gratings.

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Regarding claim 16, the analysis made in conjunction with claim 14 applies, since the polarization separating sub-system is completely the same as the polarization recombining sub-system, with the two sub-systems being completely symmetrical with respect to an axis intersecting normally element 224 at the middle point (see Fig. 17B).

Allowable Subject Matter

Claims 11-12, 26-30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 11-12, 26-30 are allowable over the prior art of record for at least the reason that even though the prior art discloses optical switching systems incorporating polarization-based separating and recombining sub-systems positioned on either end of a grating-based selectable switching/routing sub-system as well as a polarization-based separating/combining system comprising a pair of holographic gratings positioned in series, the prior art fails to teach or reasonably suggest, regarding claims 11-12, an optical switching/routing system comprising a polarization splitter/combiner and a patterned polarization converter, where the polarization splitter/combiner comprises a pair of polarization splitter/combiner gratings, and regarding claims 26-30, a polarization separating/combining system comprising a patterned polarization converter optically coupled to first and second gratings of the pair of the polarization sensitive gratings, as set forth by the claimed combination.

In Birdwell's optical switching system, the polarization separation/combining is performed by the well-known combination of a polarization beam splitter cube and a patterned half wave


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plate. The pair of holographic gratings of Dickson is used in conjunction with optical data storage systems (lines 10-12, col. 1 in Dickson). Stone (US 6,072,923, Fig. 1) discloses an optical switching system comprising a series of diffractive gratings, however, said gratings direct the incident beams into one of two paths instead of providing two output beams of different polarizations (line 29, col. 5). Finally, Nishi (US 6,285,473, Fig. 18) discloses a polarization based optical switching system, wherein a pair of holographic gratings 14, 15 are positioned on either end of a half wave plate, with the gratings acting on the incident light depending on its polarization (line 57, col. 26 to line 4, col. 27).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Leo Boutsikaris whose telephone number is 571-272-2308.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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March 27, 2006



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